

NISTIR 6527

Measurement Needs for Fire Safety: Proceedings of an International Workshop

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U.S. Department of Commerce

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FORUM Workshop: Product Tests in North America

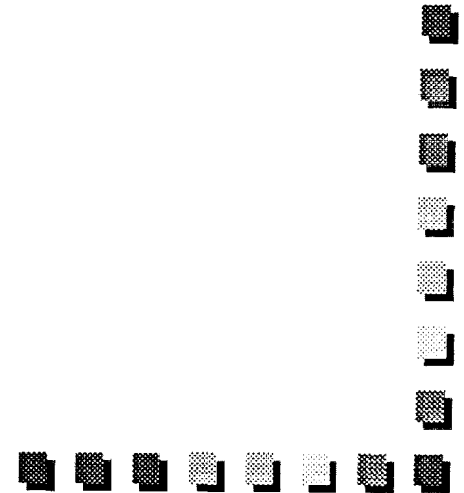
Pravinray D. Gandhi, Ph. D., P.E.
Underwriters Laboratories Inc.
333 Pfingsten Rd. Northbrook, IL 60062, USA



Presentation

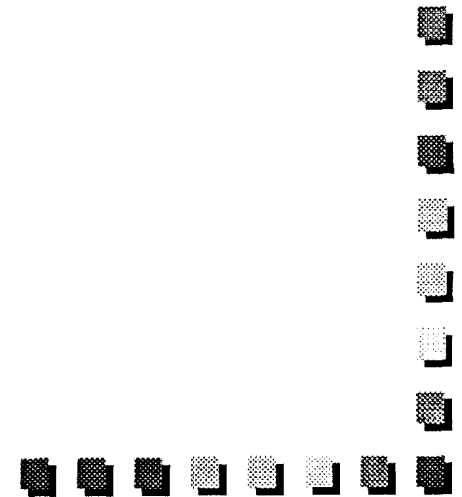
- Product Testing

- Measurement



Product Testing and Measurements

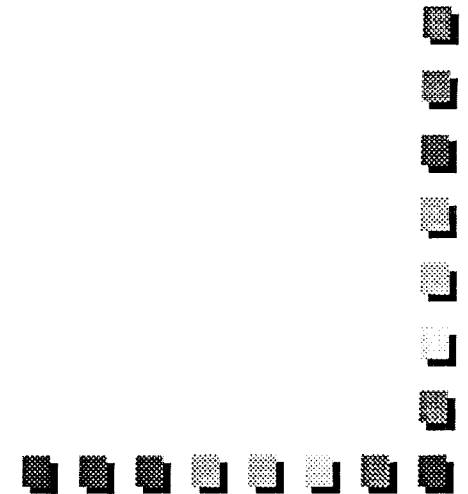
- Product Testing in the USA
 - Code requirements
 - Voluntary safety standards



Product Testing and Measurements

■ Measurements

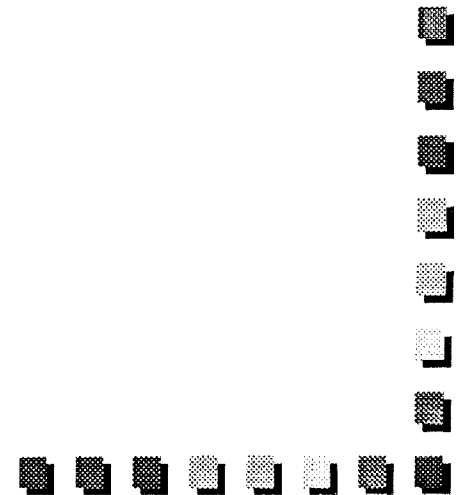
- Diverse range of measurements required dependent upon fire performance objectives and product tested
- Relevant to
 - Test parameters
 - Test results
 - Acceptance criteria



Product Testing and Measurements

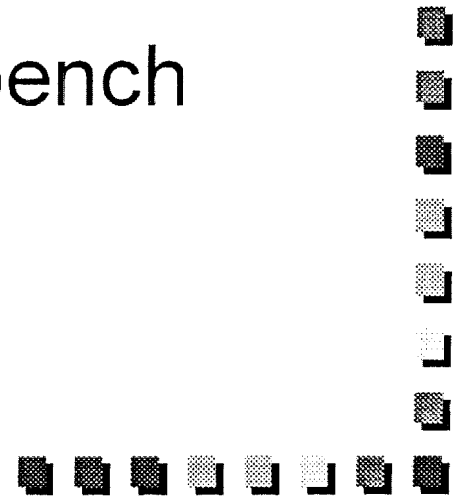
■ Examples

- Ignition Property
- Combustibility and Flame Propagation
- Fire Detection
- Fire Resistance
- Fire Suppression



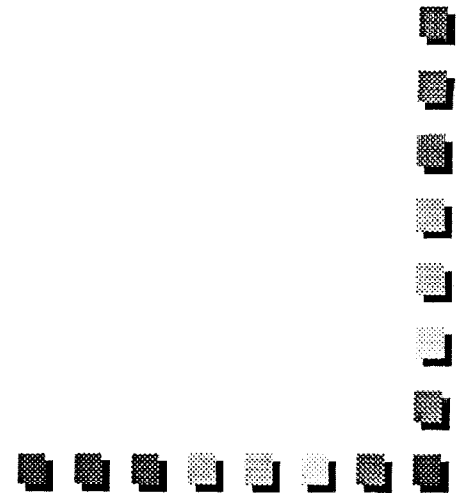
Ignition Property

- Building construction products and materials
- Interior finish materials
- Plastics insulation
- Specialty materials (e.g., wet-bench plastics)
- Others



Ignition Property

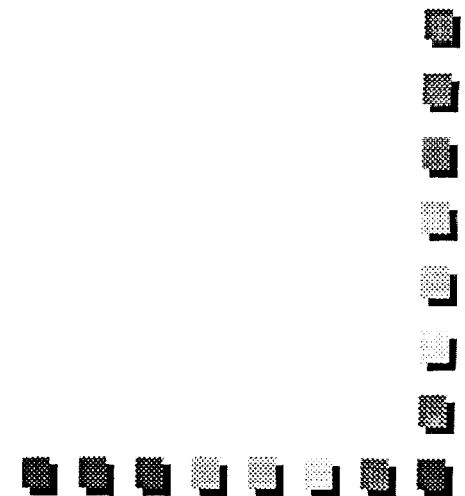
- Some test standards:
 - ASTM E136 - small-scale
 - ASTM E1929 - small-scale
 - ASTM E1354 - small-scale



Ignition Property

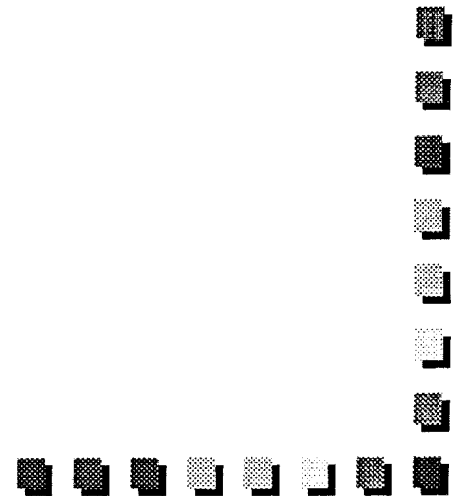
■ Measurements:

- Time
- Total heat flux
- Temperature
- Air flow rate
- Weight loss



Combustibility and Flame Propagation

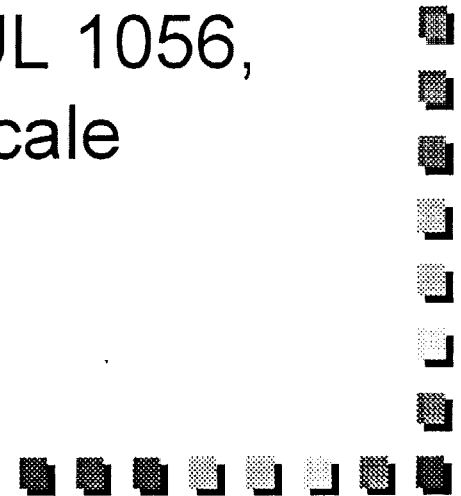
- Materials, Products and assemblies
 - Insulation plastics
 - Interior finish
 - Furnishings
 - Wire and cable
 - Roofing materials
 - Others



Combustibility and Flame Propagation

■ Some test standards:

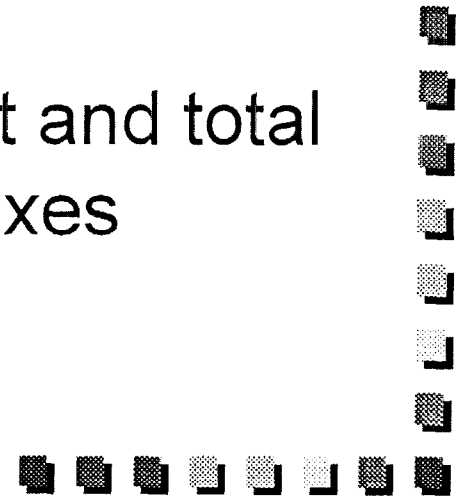
- UL 94 - small-scale
- ASTM E1354, ASTM E1317 - small-scale
- UL 1715 - full-scale
- ASTM E84, UL910/NFPA 262, UL 1056, UL 900, ASTM E108 - product scale



Combustibility and Flame Propagation

■ Measurements:

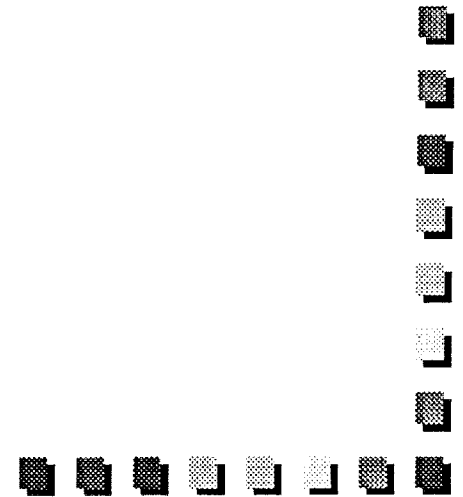
- Time
- Velocity
- Temperature
- Smoke obscuration
- Weight loss
- Gas flow rate
- Flame propagation
- Gases
- Radiant and total heat fluxes



Fire Detection

■ Products

- Smoke detectors
- Smoke detection systems
- Heat detectors



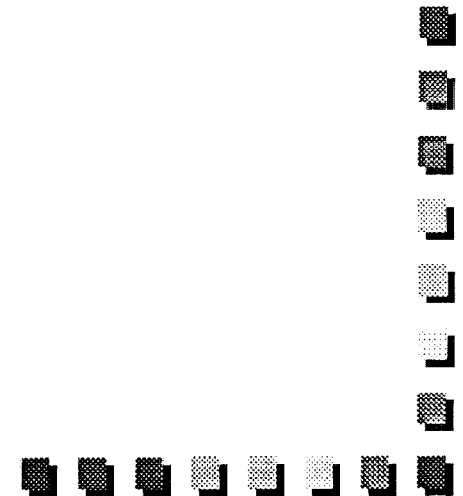
Fire Detection

■ Some test standards:

- UL 268 - product-scale
- UL 268A (air duct) - product-scale

■ Measurements:

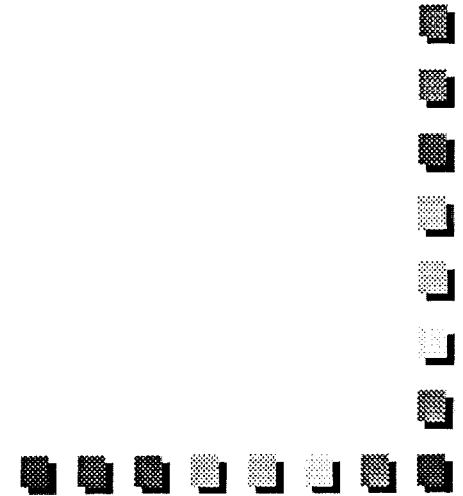
- Smoke obscuration
- Gases
- Temperature



Fire Resistance

■ Products and assemblies

- Fire doors
- Floor and ceiling assemblies
- Structural members
- Fire stop materials
- Fire safes
- etc.



Fire Resistance

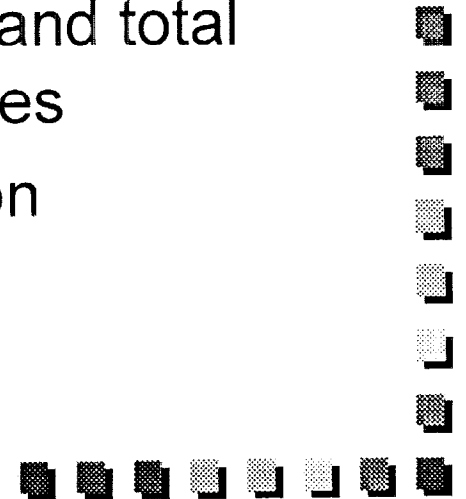
- Some test standards:

- ASTM E119, UL 263, UL 10B, UL 10C

- Measurements:

- Temperature
- Pressure difference
- Gas flow rate

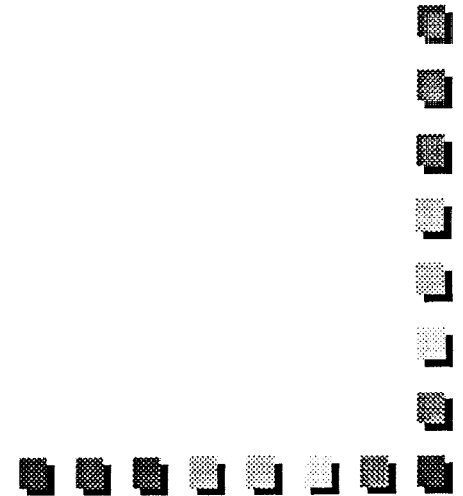
- Radiant and total heat fluxes
- Deflection



Fire Suppression

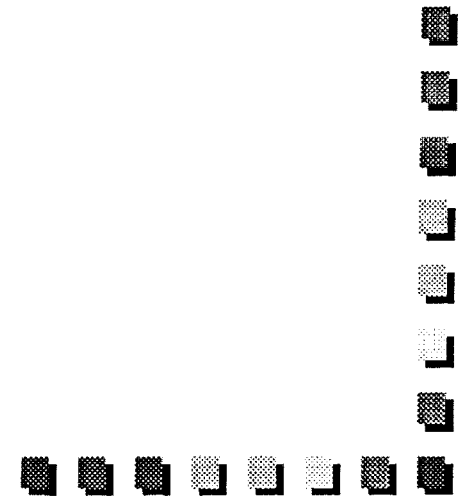
■ Products and systems

- Fire extinguishers
- Foam agents
- Sprinklers
- Clean room systems
- Misc. Hardware



Fire Suppression

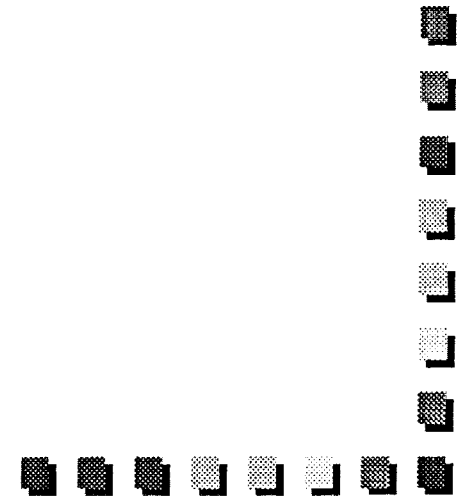
- Some test standards:
 - UL 199 - product-scale,
 - NFPA 750 - product-scale
 - Large-scale fire tests



Fire Suppression

■ Measurements:

- Time
- Water flow rate
- Temperature
- Water pressure
- Gas analysis
- Gas flow rates
- Liquids flow rate
- Foam-water proportioners
- etc.



Summary of Measurements

- Time
- Temperature
- Length
- Weight
- Pressure
- Gases
- Smoke obscuration
- Velocity
- Gas flow rate
- Water flow rate
- Liquid flow rate
- Radiant heat flux
- Total heat flux
- Others

